

Appendix H

Contact Water Collection

H-1

Pump Capacity System Calculations



Client: Kennecott Minerals Company

Project: Eagle Project MPA

Prepared by: MJP1

Checked by: JOS1

Scope ID.: 04W018

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Date: 11/16/05

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Pump Capacity Calculations

1. Purpose

The contact water management system for the Temporary Development Rock Storage Area (TDRSA) consists of an extraction sump located in the south end of the TDRSA. A submersible pump is proposed to be installed in the sump which will extract contact water and discharges it to the contact water basins. Evaluate the following conditions:

1. Estimate the average annual contact water generation for the TDRSA.
2. Size submersible pump for the extraction sump.

References: 1. USEPA, Hydrologic Evaluation of Landfill Performance (HELP) Model Version 3.04a, July 1995, see Attachment 1 for HELP case 3, output file.

2. Analysis

1. The average case condition was modeled using the HELP Model for the TDRSA assuming an open condition. The HELP Model results for the TDRSA are appended in to this report

Based on the HELP Model analysis, the average annual contact water generation rate is estimated to be 126,048 cubic feet/acre/year (HELP out put file, Attachment 1). The surface area of the TDRSA is approximately 5.9 acres; therefore, the average annual leachate generation is 743,683 cubic feet, or 5,562,750 gallons.

Based on this information, an average inflow of contact water to the sump is 10.5 gallons/minute (gpm).

2. Pump Sizing

a) Sump Size

The dimensions of the sump are 10 feet by 10 feet (bottom dimension) by 3 feet deep. The pump "on" elevation (relative to the sump bottom) is 3 feet; the pump "off" elevation is 1.5 feet.

The storage volume of the sump is calculated as follows:

$$V = 7.48 \text{ gal/ft}^3 * [1/3 * H * (A + B + (A * B)^{0.5})] * n \text{ where:}$$

V = storage volume, gallons

A = area of sump at pump "on" elevation, $\text{ft}^2 = 28' \times 28' = 784 \text{ ft}^2$

B = area of sump at pump "off" elevation, $\text{ft}^2 = 19' \times 19' = 361 \text{ ft}^2$

H = height of water column pumped during one cycle, $\text{ft} = 1.5'$

n = porosity of sump bedding material = 0.3

$$V = 7.48 * (1/3 * 1.5 * (784 + 361 + (784 * 361)^{0.5})) * (0.3)$$



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V = 1,882 gallons

- b) Pump selection - Select a pump capable of pumping approximately 50 gpm at the appropriate head. Typical EPG Companies pump information and pump curves are provided in Attachment 1

3. Conclusions

Based on an average contact water generation rate (inflow to the sump) of 10.5 gpm (as estimated by the HELP Model), a sump volume of 1,882 gallons, and a proposed extraction pump rated at 50 gpm at the appropriate design head, the pump will cycle on for approximately 45 minutes, then off for approximately 179 minutes as the sump refills. In summary, the pump will run for 45 minutes approximately every 3.7 hours.

Attachment 1

 AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1991 THROUGH 1997

	INCHES	CU. FEET	PERCENT
PRECIPITATION	29.32 (4.758)	106444.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
EVAPOTRANSPIRATION	10.226 (0.9888)	37118.55	34.871
SUBSURFACE INFLOW INTO LAYER 3	15.47213	56162.612	52.76218
LATERAL DRAINAGE COLLECTED FROM LAYER 3	34.72478 (3.98020)	126048.203	118.41645
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000 (0.00000)	0.009	0.00001
AVERAGE HEAD ON TOP OF LAYER 4	0.009 (0.001)		
CHANGE IN WATER STORAGE	-0.142 (1.4312)	-515.34	-0.484

 PEAK DAILY VALUES FOR YEARS 1991 THROUGH 1997 and their dates (DDDDYY)

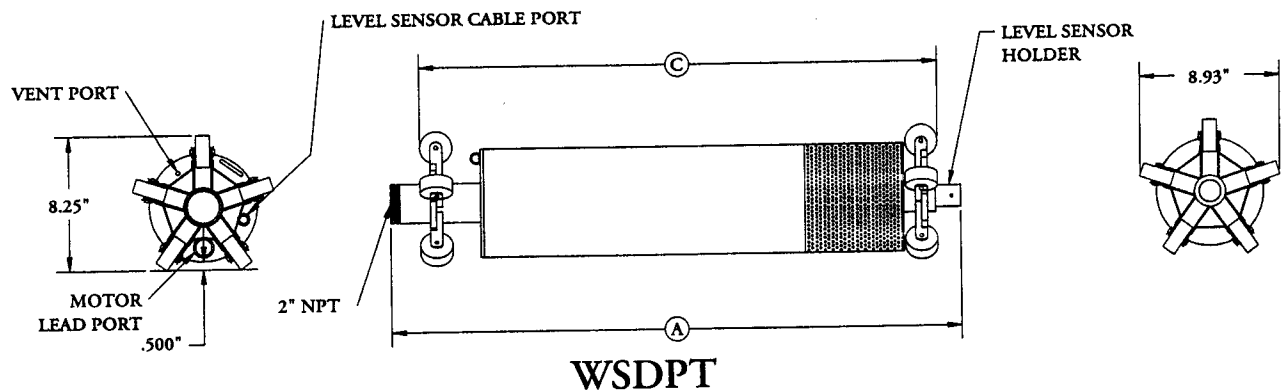
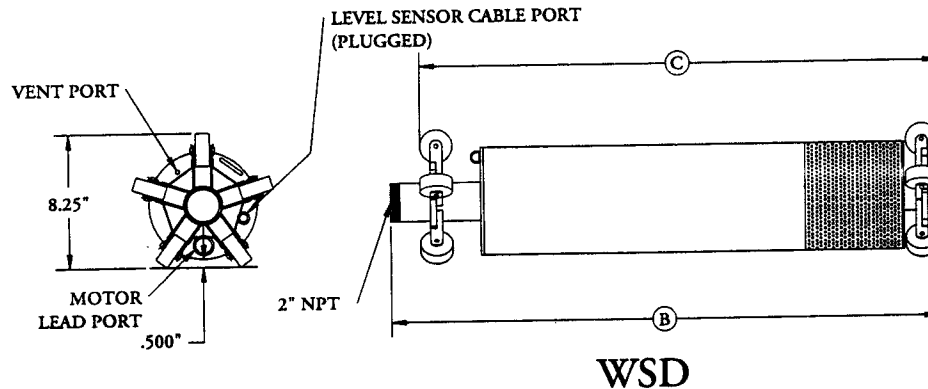
	(INCHES)	(CU. FT.)
PRECIPITATION	3.23	11724.64445 2421995
RUNOFF	0.000	0.00000 0
DRAINAGE COLLECTED FROM LAYER 3	0.95939	3482.50861 1241993
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00006 1241993
AVERAGE HEAD ON TOP OF LAYER 4	0.089	
MAXIMUM HEAD ON TOP OF LAYER 4	0.175	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.3 FEET	
SNOW WATER	8.77	31823.0757 771996
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3500	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0005	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
 by Bruce M. McEnroe, University of Kansas
 ASCE Journal of Environmental Engineering
 Vol. 119, No. 2, March 1993, pp. 262-270.

 FINAL WATER STORAGE AT END OF YEAR 1997

SERIES 12 SIZE 6 WHEELED SUMP DRAINER



MODEL	HP	PHASE	A	B	C	*APPROX. SHIPPING WEIGHT	
						WSD	WSDPT
12-1	1.00	1	41.42	40.29	38.44	94.75	99.75
12-1	1.00	3	41.42	40.29	38.44	94.75	99.75
12-2	1.50	1	45.89	44.76	42.91	105.59	110.59
12-2	1.50	3	44.02	42.89	41.04	98.56	103.56
12-3	2.00	1	49.99	48.86	47.01	114.02	119.02
12-3	2.00	3	48.49	47.36	45.51	109.40	114.40
12-4	3.00	1	61.09	59.96	58.11	150.03	155.03
12-4	3.00	3	58.09	56.96	55.11	135.79	140.79
12-5	3.00	1	63.69	62.56	60.71	153.85	158.85
12-5	3.00	3	60.69	59.56	57.71	139.60	144.60
12-6	5.00	1	72.29	71.16	69.31	179.15	184.15
12-6	5.00	3	66.29	65.16	63.31	157.66	162.66

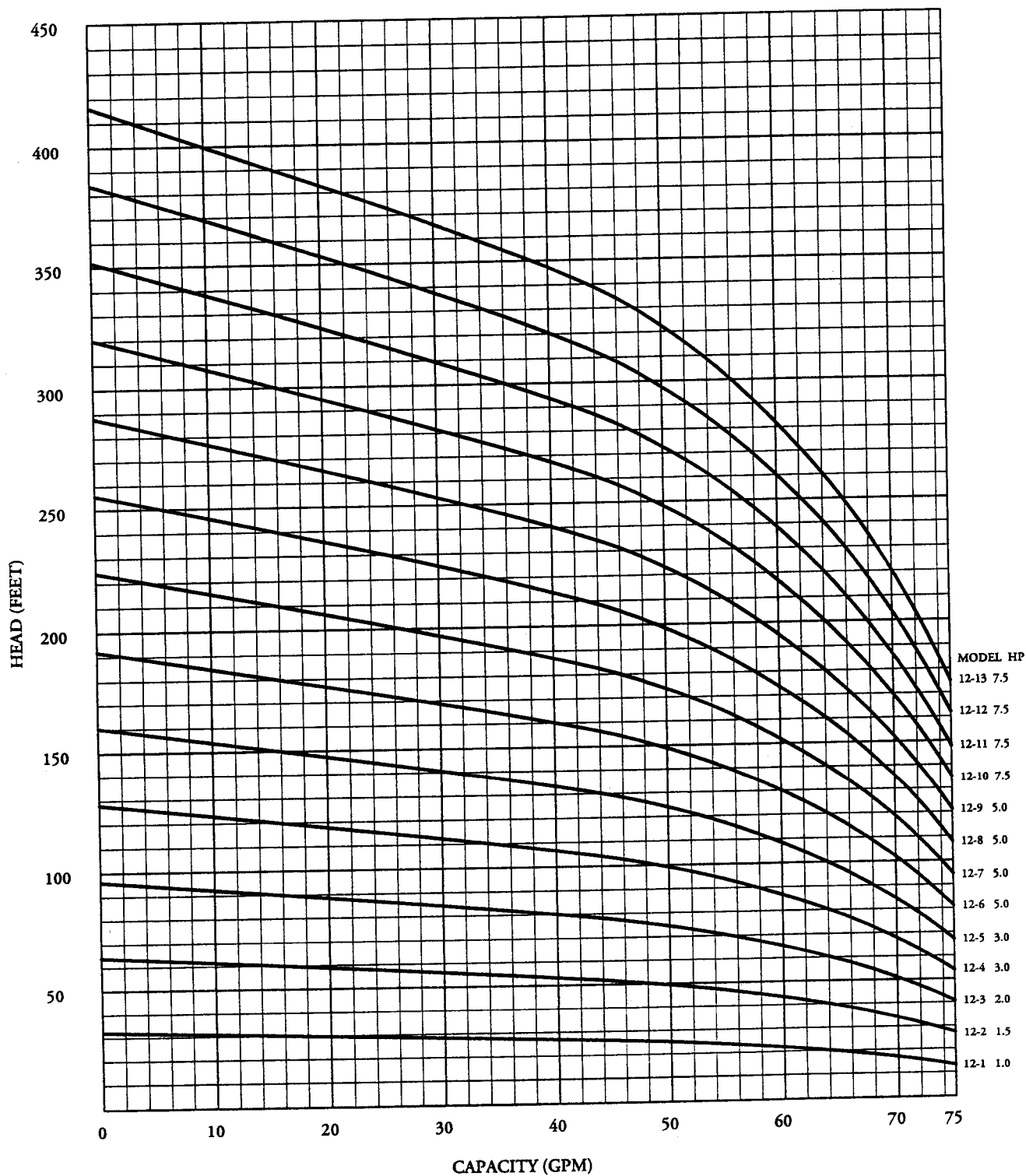
MODEL	HP	PHASE	A	B	C	*APPROX. SHIPPING WEIGHT	
						WSD	WSDPT
12-7	5.00	1	74.89	73.76	71.91	182.97	187.97
12-7	5.00	3	68.89	67.76	65.91	161.47	166.47
12-8	5.00	1	77.49	76.36	74.51	186.78	191.78
12-8	5.00	3	71.49	70.36	68.51	165.29	170.29
12-9	5.00	1	80.09	78.96	77.11	190.59	195.59
12-9	5.00	3	74.09	72.96	71.11	169.10	174.10
12-10	7.50	3	79.34	78.22	76.37	226.79	231.79
12-11	7.50	3	81.94	80.82	78.97	230.60	235.60
12-12	7.50	3	84.54	83.42	81.57	234.41	239.41
12-13	7.50	3	87.14	86.02	84.17	238.23	243.23

NOTE: ALL DIMENSIONS ARE IN INCHES.

*SHIPPING WEIGHT INCLUDES
WSD: CRATE, 50' OF 12-4 MOTOR LEAD, 50' OF 3/16" SS CABLE.
WSDPT: CRATE, 50' OF 12-4 MOTOR LEAD, 50' OF 3/16" SS CABLE,
LEVEL SENSOR AND CABLE.

SERIES 12 SurePump™

Flow Range 35-75 GPM
60 Hz



DATA SUBJECT TO CHANGE WITHOUT NOTICE